(6.4 in.) of actuator displacement. The failure was explosive, causing crushing of the top flange of the girder at the midspan.

4.5 Test Results

4.5.1 Tests for Initial Cracking

Crack Development — Static tests to determine the initial flexural cracking were repeated three times as indicated in Table 4.4. During the first static load test, A-1, the first flexural crack was observed when the load was at 925 kN (208 kips). When the load reached 1,068 kN (240 kips), there were four flexural cracks in the bottom flange with the spacing varying from 356 to 508 mm (14 to 20 in.) and the maximum crack length of 737 mm (29 in.) from the bottom of the girder. The crack width was quite small, in the order of 0.18 mm (0.007 in.). When the loading was removed, the girder fully recovered and the cracks were hardly visible.

The second and the third static load tests, A-2 and A-3, were performed to observe the reopening of the cracks which occurred when the load was 623 kN (140 kips). The tests did not cause any change in the crack properties from the first test A-1.

Deformation and Stiffness — The girder behaved elastically before the initial cracking as shown by the load-displacement curve A in Figure 4.3. The slope of the curve is 290 kips/in. (50.8 kN/mm). Therefore the flexural stiffness of the girder can be computed as

$$EI = (290)\, L^3/48 = (290)\, (63.67)^3 (1{,}728)/48$$
$$= 2{,}695 \times 10^6 \text{ kips-in}^2 \; (7{,}735 \times 10^9 \text{ kN-mm}^2)$$

where E is the modulus of the concrete, I is the moment of inertia of the girder and L is the span of the girder. Since I = 521,180 in^4 (216,810 x 10^6 mm^4), then

$$E = 2{,}695 \times 10^6/521{,}180 = 5.18 \times 10^3 \text{ ksi. } (35.7 \text{ Gpa})$$